REMARKS

The present application includes Claims 1-30, with Claims 1-24 being previously elected along with the species of Figure 6. In the Office Action the Examiner objected to Claims 7-14, 16-19 and 22-24 as not being drawn to the elected species of Figure 6. Applicants respectfully point out that with relation to the subject matter of Claim 11, which is directed to a conductor trench 12 which is rectangular in cross-section, is, in fact, shown in Figure 6. Accordingly, it is respectfully requested that Claim 11 is drawn to the elected species of Figure 6.

Relative to foreign priority, applicants are submitting herewith a certified copy of the application as required by 35 USC §119(b).

As to the drawing objection, corrected drawings are being submitted herewith which are believed to address the Examiner's objection. In particular, all parts shown in the cross-sectional drawings of Figures 2-14 are properly cross-hatched. Figures 2-14 show the individual layer blank 110 and circuit board layers 10 with a cross-hatch for a plastic material (MPEP, page 600-95, August 2001). The cooling agent in Figure 8 is cross-hatched for liquid. The waveguide 40 in Figures 12-14 is cross-hatched for transparent material. The optoelectronic components 28 in Figures 7, 8 and 12 and the mirrors 44 in Figures 13-14 are appropriately cross-hatched for a semi-conductor material. In addition, reference numeral 22 has been added to Figure 6. The corrections are shown circled in red. Each drawing sheet is properly identified according to 37 CFR 1.84(c). Formal drawings will be submitted upon Examiner's approval of the drawing corrections.

As to the objections to the specification, the specification has been amended, as suggested

by Examiner, so that the contact opening 22 is now referred to as a through hole 22 throughout the specification. In paragraph 5 of the Office Action, the Examiner also makes reference to "any similar errors" in the specification, but it is unclear to the applicants as to which errors , if any, the Examiner is referring to in the specification. The applicants therefore request that the Examiner clarify what, if any, similar errors exist. Accordingly, the applicants have amended the specification as pertaining to the through hole 22 but respectfully request further clarification as to what "any similar errors" Examiner is referring to within the specification.

Regarding the objection as to the title of the invention, the title has been amended to "A Circuit Board Consisting of At Least Two Individual Circuit Board Layers Made of Plastic".

As to the §112 rejection, Claim 1 has been amended to clarify the positioning formations. Amended claim 1 now recites that "said at least one microstructured positioning formation being comprised of at least one projection and at least one recess positioned in interconnecting engagement, said at least one projection being formed on at least one of the first and second functional sides of one of said at least two individual circuit board layers (10), said at least one recess being formed on at least one of the first and second functional sides of another of said at least two individual circuit board layers (10) and positioned in interconnecting engagement with said at least one projection". Corresponding reference numeral changes have been made to the drawings and specification. By way of example, Figure 6 illustrates the projection 16A and the recess 16B in interconnecting engagement. It is respectfully believed that this amendment adequately addresses the Examiner's rejection.

As to the §103 rejection, applicants respectfully disagree that Haba et al. U.S. Patent No. 6,188,028 would render amended Claim 1 obvious. Amended Claim 1 recites the limitation that

the "positioning formation being formed during formation of said circuit board layers". With reference to Figures 2-5, the specification illustrates and describes the formation of an individual layer blank 110 where the positioning formation preform 116 is formed during formation of the circuit board layer.

In Haba the openings 122 and the distal end portion 140 are not formed during the formation of the circuit board layer. Rather they are formed in or created from the already formed circuit board layers through a series of steps which include electroplating, using a photoresist mask, and etching. In particular, Figures 3-7 illustrate the sequential steps which are required to form the opening 122 through one or more of the layers of the circuit panel (Column 9, beginning on line 8). Similar steps are required in Figures 7-8 to create the distal end portion 140, which receives the opening 122 of an adjacent stacked circuit panel 102.

In contrast, claimed invention, as amended in Claim 1, includes that the positioning formation is formed during formation of the circuit board layers. On page 10 of the specification lines 6-10, the individual layer blank 110 as shown in Figure 2 is already formed with positioning formation performs 116 including a depression 116B and a protrusional 116A. The positioning formation 16 is also shown relative to the two stacked individual layers 110 in Figure 6. The positioning formation 16 is formed during formation of the circuit board layer rather than through sequential steps of electroplating, photoresist mask formation and/or etching. Accordingly, the Haba reference does not teach or suggest the claimed invention as amended in Claim 1.

Moreover, the claimed positioning formation, since it is formed during formation of the circuit board layers, allows for a plurality of individual layers to be precisely aligned relative to

one another when placed one on top of the other and thus allows for two or more individual layers to be precisely arranged and aligned in a stacked arrangement which is also not disclosed or suggested in the Haba reference.

For example, Haba recites, in column 8, lines 14-20, that the specific shape of the opening 122 must allow for "misregistration tolerances of the post pitch." The post 138 of the distal end portion 140 is not precisely aligned with the opening 122 and the shape of the opening 122 must allow for misalignments between the circuit panels. Haba therefore teaches that the post 138 cannot be precisely positioned in the opening 122 for stacked alignment of the layers due to the limitations inherent in the etching masks which are used for forming the openings 122, the distal end portions 140 and the end post 138. So, the circuit board in Haba which consists of a plurality of individual layers in a stacked arrangement will not be precisely aligned according to their corresponding openings 122, distal end portions 140 and end posts 138, which is contrary to the applicants claimed positioning formations.

It is respectively submitted that the amended claims which are drawn to the elected invention, Claims 1-6, 11, 15 and 20-21 are distinguishable over the cited reference. Reconsideration of allowance of the application is respectfully requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

Please rewrite the title on page 1 to read as follows:

A Circuit Board Consisting of At Least Two Individual Circuit Board Layers Made of Plastic ~~Circuit Board and Method of Manufacturing a Circuit Board~~

IN THE SPECIFICATION:

Please replace the paragraph on page 10, lines 6-10 with the following rewritten paragraph.

The individual layer blank 110 shown in Fig. 2 and formed from such a formation tool already has, for instance, ~~already~~ conductor trench preforms 112, a mount preform 114 as well as positioning formation preforms generally shown at 116, here embodied as depressions 116B and/or protrusions 116A. A cooling groove preform 120 is also provided, the function of which will be described later.

Please replace the paragraph on page 12, lines 13-21 with the following rewritten paragraph.

In Fig. 6 there is shown an embodiment of a circuit board which consists of two superimposed individual layers. The two individual layers are positioned by an engagement of the protrusions 16A which are formed on the upper side of the lower individual layer, in the depressions 16B which are formed on the underside of the upper individual layer. In this way there can be arranged, of course, more than two individual layers on top of each other, so that a circuit board is formed which consists of a plurality of individual layers. Only for reasons of

better clarity the embodiments described have two individual layers each.

Please replace the paragraph on page 12, lines 27-30 through page 13, lines 1-7 with the following rewritten paragraph.

In order to make possible an electrical bonding between various functional sides of the individual layers, the individual layers 10 in the embodiment shown in Fig. 6 are provided with a through hole ~~contact opening~~ 22 each, which is already formed in the individual layer blank 110 as a through hole ~~contact opening~~ preform 122. The through hole ~~contact opening~~ preform 122, too, is metallized during the pre-metallization and subsequent galvanic thickening, so that an electrical conductive connection is achieved between the two functional sides of the individual layer 10. On mounting the individual layers to each other an electrical conductive adhesive 24 is used in the region of the through hole ~~contact opening~~ 22, so that the desired electrical connection is achieved by conductive bonding. As an alternative, a soldering paste could be used.

Please replace the paragraph on page 13, lines 8-12 with the following rewritten paragraph.

According to a further development (not shown) the through hole ~~contact opening~~ 22 could also be designed to have such a diameter and the metallization deposited there could be configured to have such a wall thickness that, similar to the effect of the cooling groove, a heat removal is possible by thermal conduction between the two functional sides of an individual layer.

Please replace the paragraph on page 14, lines 6-13 with the following rewritten paragraph.

In Fig. 8 there is illustrated an embodiment in which a cooling channel 34 is provided on the upper side of the lower individual layer, which cooling channel may be used for active cooling the circuit board. Similar to a conductor trench, also the cooling channel 34 ~~35~~ is provided with a metallization on its inner side; this metallization, however, is rather a "by-product", because basically all deeper regions of the individual layer are metallized upon manufacturing. The metallization is not necessary for the function of the cooling channel.

IN THE CLAIMS:

Please amend Claim 1 as follows:

1. (Amended) A circuit board (5) consisting of at least two individual circuit board layers (10) made of plastics and produced by formation technique, which each have first and second functional sides and at least one microstructured positioning formation (16), said at least one microstructured positioning formation being comprised of at least one projection and at least one recess positioned in interconnecting engagement, said at least one projection being formed on at least one of the first and second functional sides of one of said at least two individual circuit board layers (10), said at least one recess being formed on at least one of the first and second functional sides of another of said at least two individual circuit board layers (10) and positioned in interconnecting engagement with said at least one projection, ~~on the first and second functional side,~~ said positioning formation being formed during formation of said circuit board layers, and at least one microstructured conductor trench (12) on one of the functional sides, the conductor trench (12) being provided with a metallization (18).